

# Memorandum

To: MR. MICHAEL KEEVER  
Office of Structure Design  
Bridge Design Branch 15

Date: June 13, 2001

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11-199361

Attention: MR. SURJIT DHILLON



Rockwood Canal Bridge  
Bridge No. 58-0335R/L

From: **DEPARTMENT OF TRANSPORTATION**  
DIVISION OF ENGINEERING SERVICES  
Geotechnical Services, MS#5  
Structure Foundation South

Subject: Foundation Recommendations

In response to the request received April 4, 2001, this report provides foundation recommendations for the construction of the proposed new Rockwood Canal bridges. The proposed single span cast-in-place reinforced concrete slab bridges will span the open concrete lined Rockwood Canal, east of the existing Rockwood Canal bridges. Construction of the proposed structures are part of the Route 111 realignment project (converting a two lane highway into a four lane divided expressway).

A field study was completed on May 1, 2001 by Structure Foundation South Branch. The investigation consisted of drilling three, 94mm diameter, wet rotary sample borings and two cone penetration tests. Boring #B5-01 was used for downhole testing of compression and shear wave velocities (P-S log). Boring #B1-01 was E-logged, using induction testing method. The new Log of Test Borings is being prepared and will be forwarded, which are to be included in the contract plans. No "As Built" Log of Test Borings are available for the existing Bridge # 58-122 (about 44m west of the proposed structures). The following resources were used for the foundation evaluation:

- ◆ Recent soil test borings completed in 2001, for the new bridges.
- ◆ Geotechnical roadway reports and boring logs prepared by Geotechnical Design Branch-South, District 11.

All elevations shown in this report and on the Log of Test Borings are based on the 1988 NAVD+100m Vertical datum.

## Site Description

The site is located on Mead Road east of Route 111, about 1.6km south of the city of Brawley, in Imperial County. The existing Rockwood Canal Bridge # 58-122, is a three-span structure, built in 1950 and supported on 285 kN precast concrete piles. The existing land in the area is primarily farm land that is irrigated and drained by a network of canals and drains operated by the Imperial Irrigation District. The topography in the general area is flat with elevations ranging from 13 to 19 m below sea level.

## Site Geology

The project area lies in the Imperial Valley as part of the Salton Trough geomorphic province. Based on boring results, the site is underlain by recent lake bed (lacustrine) deposits derived from the historical lake Coahuilla. These materials are comprised of silty sand, sandy silt, silt, lean and fat clay. Horizontal bedding and laminations are evident within the silt and clay layers. There are no known contaminated soils at the proposed bridge sites or in the general area. The general soil profile from ground surface to the maximum depth explored consists of:

- A. 13.0m of soft to firm/very loose to loose silt (sandy or with sand), lean clay (sandy or with sand) and fat clay (sandy or with sand) with interbeds and lenses of silty fine sand.
- B. 14.0m of dense to very dense fossiliferous silty fine sand.
- C. 1.6m of medium dense silt and sandy silt.
- D. About 2.3m of very stiff fat clay with lenses of silt.

Ground water was measured on May 2, 2001, at elevation 61.14m. Nearby Boring B0012-10 (located at 36m Lt. Sta. 338+57, drilled by Jeff Kermode, Geotechnical Design Branch-South, District 11) showed static ground water measured on April 26, 2001, at elevation 60.98m. However, as a result of farm irrigation and possible canal leakage water levels can be as high as surface water level in the canal (elev.  $\pm$  63.0m). Intermittent perched ground water comprises the bulk of ground water regime. Perched ground water levels measured along the project alignment ranged between 1.3 and 2.5 m below existing ground surface. It should be noted that ground water levels can fluctuate with the change of season and other factors.

Surface water runoff is by sheet flow which empties into the canal and nearby drain ditch. All surface waters from canals and ditches drain into the Alamo River and eventually into the Salton Sea. Water flow in the canal should have negligible scouring effect on the piles since the canal is concrete lined.

## Corrosion Potential

Composite soil samples were taken from all rotary borings at the ground surface (ranging elev. of 64.51 to 64.31m) to the maximum boring depths. These samples were sent to the laboratory for corrosion testing. When the test results are available they will be forwarded to the Office of Structure Design (OSD). Two surface water samples were also taken from Rockwood canal and Bryant drainage ditch (21-26m north of the canal) and were tested for corrosion potential. District test results indicate that the soils at the vicinity of the bridge sites are corrosive to metal and reinforced concrete. Should our test results be any different than indicated, OSD will be notified as soon as they are received. However, test results of water samples from both Rockwood Canal and drainage ditch were noncorrosive, although resistivities are below standard (1000 ohm-cm). Refer to Table No.1 below for specific test results.

Corrosion resistant design and construction materials are advised. Corrosion Technology Branch should be consulted regarding test results and possible recommendations. It should be noted that chloride and sulfate content of the tested soils could become higher due to the stoppage of flooding and leaching of the farm lands and long term evapotranspiration.

**Table No. 1**  
**Surface Water-Corrosion Test Summary**

Location	Sample Depth	Sample Date	PH	Minimum Resistivity	Chloride content	Sulfate content
Rockwood Canal	Surface	5/1/01	7.6	990 ohm-cm	98 ppm	250 ppm
Drainage ditch	Surface	5/1/01	7.1	750 ohm-cm	130 ppm	340 ppm

Note: For corrosion definitions refer to "Memo to Designers" 3-1.

### Seismicity

The site is located within the Brawley Seismic Zone triangle. The Brawley-Imperial/E fault zone-trace of 1979 (M=7.0) is mapped about 2.5km southeast of the site. Also the Brawley-Imperial/W fault zone-trace of 1979 (M=7.0) is mapped about 3.2km southwest of the site. The peak horizontal bedrock acceleration at the site is 0.6g for fault zones. The area is located in an active area crisscrossed by numerous northwest trending right-lateral strike slip and westerly trending normal faults. For final seismic design information and site specific criteria, the Geotechnical Earthquake Engineering Branch should be contacted.

### Foundation Recommendations

The following foundation recommendations are for the proposed new Rockwood Canal bridges No. 58-335R/L as shown on the General Plan revised February 5, 2001.

For the support of the proposed diaphragm type abutments on both structures, driven Class 400C, Alternative "Y" precast, prestressed concrete piles are recommended. The specified pile tip elevations are provided below in Table No. 2.

**Table No. 2**  
**Pile Data**

Support Location	Pile Type (Alt. Y)	Design Loading	Nominal Resistance		Elevation (meters)		
			Compression	Tension	Bottom of Abut. Diaphragm	Design Pile Tip	Specified Pile Tip
Abut. 1R	Class 400C	400 kN	800 kN	0 kN	63.42	50.0	50.0
Abut. 2R	Class 400C	400 kN	800 kN	0 kN	63.42	50.0	50.0
Abut. 1L	Class 400C	400 kN	800 kN	0 kN	63.42	50.0	50.0
Abut. 2L	Class 400C	400 kN	800 kN	0 kN	63.42	50.0	50.0

The ultimate geotechnical capacity of the piles will equal the required nominal resistance in compression.

## **General Notes**

All support locations are to be plotted on the Log of Test Borings in plan view as stated in "Memo to Designers" 4-2. The plotting of the support locations should be completed prior to requesting a foundation review.

## **Constructibility Considerations**

1. The calculated geotechnical capacity of driven piles at all support locations noted in the table No. 2 above are based on a combination of skin friction and end bearing.
2. Pile bearing will be assessed by the ENR equation according to the Standard Specifications, Section 49-1.08 "Bearing values and penetration". Any pile that achieves refusal within 1.2 meter of specified pile tip elevations may be accepted at the Resident Engineer's discretion. This procedure should prevent damage to the piles. Refusal for the piles shall be defined as 2x the design loading as shown on the contract plans and above in Table No. 2. Two times the required design loading for the Class 400 piles will be 800 kN (90 tons).
3. If the E.N.R. bearing is not achieved at specified tip, the contractor should allow the piles to set up for a minimum period of 24 hours, prior to restriking piles to verify bearing.
4. Although static ground water was measured at elevation 61.14m during the field study, it is anticipated that relatively shallower ground water could be encountered. Efforts should be made to schedule foundation construction during the dry season to avoid higher ground water levels. Minor seepage should be expected in excavations.
5. Piles are to be driven in over-sized predrilled holes according to Standard Specification 49-1.06, to elevation +62.0m or 0.5m below the invert whichever is lower. The predrilling is to be performed to prevent potential damage to the canal lining during pile driving. However, there is a likelihood of caving and sloughing. Caving could happen readily within shallow loose and saturated sand.
6. It is recommended that foundations for the future median widening be constructed during this contract to alleviate construction problems, eliminate the possible damage to the canal lining and for economical reasons. The future cost of bringing pile driving equipment to the site will be substantial compared to the present cost of pile installation.

The recommendations contained in this report are based on specific project information regarding pile type and locations that has been provided by the Office of Structure Design. If any conceptual changes are made during final project design, the Office of Geotechnical Services should review those changes to determine if these foundation recommendations are still applicable. Any questions or comments regarding the above recommendations should be directed to Faramarz Gerami (562) 864-8472 or Mark DeSalvatore (916) 227-7056.

Report by:

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Reviewed by:

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c: R.E. Pending  
DBarlow - Specs & Estimates  
OAlcantara - Proj Mgmt  
TRuchman - Specs Dev.  
LHuynh - PCE  
APadilla - Materials Investigation (District 11)  
SSorourbakhsh - Proj Mgmt (District 11)  
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